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Seed Transfer Guidelines for Western Larch in the Northern Rocky Mountains

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ABSTRACT

Seed transfer guidelines are developed for western larch from patterns of adaptive variation. Even though geographically lateral transfers maybe rather broad, elevational transfer should be limited to ±750 feet from the elevation of the seed source.

KEYWORDS: seed zones, seed transfer, adaptive variation

Artificial reforestation carries the risk that planted trees will not be adapted to the environment in which they are planted. This risk can be reduced by limiting the distance that seeds are moved from their origin. These limits, embodied in seed transfer guidelines, must be based on genetic differentiation of populations for traits reflecting adaptation to natural environments. This research note presents seed transfer guidelines for western larch (*Larix occidentalis*) based on patterns of genetic variation that were published previously (Rehfeldt 1982).

An appropriate limit to seed transfer is defined (Rehfeldt 1979) as the minimum geographic or elevational interval across which differences among populations can be detected at the 80% level of probability. For western larch, such differences could be detected between populations separated by about 1,500 feet in elevation. Geographic differentiation, independent of elevation, is illustrated in figure 1 by contours of relatively equal performance. In this figure, the contour interval is scaled to a value of one-fourth the minimum geographic interval over which differentiation could be detected. The zero contour depicts populations of lowest growth potential but highest cold hardiness.

These intervals can be used to construct either discrete seed zones or floating transfer guidelines. Discrete seed zones for western larch should occupy no more than 1,500 feet elevation and four contour bands. Seed from a single source should be transferred no more than ±750 feet elevation or ±2 contour bands.

Floating transfer guidelines are developed from the similarities between elevational and geographic patterns of genetic variation: seed movement across contours of high numeric value to low numeric value is similar genetically to seed movement from low elevation to high elevation within a contour band. This means that whenever seed is transferred across contours of decreasing numeric value, the appropriate elevational interval for seed transfer should be lowered by 375 feet for each contour crossed. Whenever seed is transferred across contours of increasing numeric value, the appropriate interval is increased by 375 feet for each contour crossed. For example, seed from a source at 5,000 feet in the outermost band (fig. 1) may be used between elevations of 4,250 and 5,750 feet anywhere within that band. But, across 5 contours to the east or northeast, the same seeds should be grown at elevations between 2,375 and 3,875 feet. Thus, a single seed production area could serve several bands. Such floating guidelines provide flexibility in seed transfer while maintaining adaptation.

The present guidelines were developed from a single study of juvenile trees. Losses in productivity caused by maladaptation acrue throughout the life cycle. Therefore, future information may demand an alternation of the present guidelines.

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Figure 1.—Geographic patterns of genetic variation among populations of western larch in the Northern Rocky Mountains. The zero contour depicts populations of lowest growth potential but highest cold hardiness.

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